

CLAIMS

What is claimed is:

1 1. A method for generating a halftone from a plurality of pixels,
2 comprising:
3 modulating dot density according to pixel intensity;
4 controlling dot cluster size according to pixel intensity; and
5 modulating dot size according to pixel intensity.

1 2. The method of Claim 1, wherein modulating dot density comprises
2 implementing an error diffusion algorithm that is a function, at least indirectly, of
3 pixel intensity.

1 3. The method of Claim 2, further comprising, for at least one pixel,
2 obtaining a dot density factor corresponding to the pixel's intensity, and
3 wherein implementing an error diffusion algorithm comprises implementing an
4 error diffusion algorithm that is a function, at least in part, of the dot density
5 factor.

1 4. The method of Claim 1, further comprising, for at least one pixel,
2 obtaining a cluster factor corresponding to the pixel's intensity and wherein:
3 controlling dot cluster size comprises calculating a threshold value as a
4 function, at least in part, of a dot screen and the cluster factor; and
5 modulating dot density comprises implementing an error diffusion
6 algorithm that is a function, at least indirectly, of the pixel's intensity and the
7 threshold value.

1 5. The method of Claim 4, further comprising obtaining a dot density
2 factor corresponding to the pixel's intensity, and wherein implementing an error
3 diffusion algorithm comprises implementing an error diffusion algorithm that is a
4 function, at least in part, of the dot density factor and the threshold value.

1 6. The method of Claim 2, further comprising obtaining a dot size
2 factor corresponding to the pixel's intensity and wherein:
3 implementing the error diffusion algorithm generates a dot placement
4 indicator; and
5 modulating dot size comprises generating a halftone print code as a
6 function of the dot size factor and the dot placement indicator.

1 7. The method of Claim 1, wherein for each pixel:
2 controlling a size of a dot cluster comprises obtaining a cluster factor
3 corresponding to the pixel's intensity and calculating a threshold value as a
4 function of a dot screen and the cluster factor;
5 modulating dot density comprises obtaining a dot density factor
6 corresponding to the pixel's intensity and implementing an error diffusion
7 algorithm that is a function of the dot density factor and the threshold value to
8 generate a dot placement factor; and
9 modulating dot size comprises obtaining a dot size factor corresponding
10 to the intensity value and generating a halftone print code as a function of the
11 dot size factor and the dot placement indicator.

1 8. The method of Claim 7, wherein:
2 obtaining a cluster factor comprises locating a first look-up table entry
3 corresponding to the pixel's intensity and acquiring the cluster factor from that
4 first entry;
5 obtaining a dot density factor comprises locating a second look-up table
6 entry corresponding to the pixel's intensity and acquiring the dot density factor
7 from that second entry; and
8 obtaining a dot size factor comprises locating a third look-up table entry
9 corresponding to the pixel's intensity and acquiring the dot size factor from that
10 third entry.

1 9. The method of Claim 8, wherein the first, second, and third entries
2 are a single look-up table entry.

1 10. The method of Claim 7, wherein:
2 obtaining a cluster factor comprises calculating the cluster factor
3 according to the pixel's intensity;
4 obtaining a dot density factor comprises calculating the dot density factor
5 according to the pixel's intensity; and
6 obtaining a dot size factor comprises calculating the dot size factor
7 according to the pixel's intensity.

1 11. A method for generating a halftone from a plurality of pixels,
2 comprising for at least one pixel:
3 obtaining a cluster factor corresponding to the pixel's intensity and
4 calculating a threshold value as a function of a dot screen and the cluster factor;
5 obtaining a dot density factor corresponding to the pixel's intensity and
6 implementing an error diffusion algorithm that is a function of the dot density
7 factor and the threshold value to generate a dot placement factor; and
8 obtaining a dot size factor corresponding to the intensity value and
9 generating a halftone print code as a function of the dot size factor and the dot
10 placement indicator.

1 12. A computer readable medium having instructions for:
2 modulating dot density according to pixel intensity;
3 controlling dot cluster size according to pixel intensity; and
4 modulating dot size according to pixel intensity.

1 13. The medium of Claim 12, wherein the instructions for modulating
2 dot density include instructions for implementing an error diffusion algorithm
3 that is a function, at least indirectly, of pixel intensity.

1 14. The medium of Claim 13, having further instructions for obtaining,
2 for at least one of a plurality of pixels, a dot density factor corresponding to the
3 pixel's intensity, and wherein the instructions for implementing an error
4 diffusion algorithm include instructions for implementing an error diffusion
5 algorithm that is a function, at least in part, of the dot density factor.

1 15. The medium of Claim 12, having further instructions for obtaining,
2 for at least one of a plurality of pixels, a cluster factor corresponding to the
3 pixel's intensity and wherein:
4 the instructions for controlling dot cluster size include instructions for
5 calculating a threshold value as a function, at least in part, of a dot screen and
6 the cluster factor; and
7 the instructions for modulating dot density include instructions for
8 implementing an error diffusion algorithm that is a function, at least indirectly, of
9 the pixel's intensity and the threshold value.

1 16. The medium of Claim 15, having further instructions for obtaining a
2 dot density factor corresponding to the pixel's intensity, and wherein the
3 instructions for implementing an error diffusion algorithm include instructions for
4 implementing an error diffusion algorithm that is a function, at least in part, of
5 the dot density factor and the threshold value.

1 17. The medium of Claim 13, having further instructions for obtaining,
2 for at least one of a plurality of pixels, a dot size factor corresponding to the
3 pixel's intensity and wherein the instructions for:
4 implementing the error diffusion algorithm generates a dot placement
5 indicator; and
6 modulating dot size include instructions for generating a halftone print
7 code as a function of the dot size factor and the dot placement indicator.

1 18. The medium of Claim 12, wherein the instructions for:
2 controlling a size of a dot cluster include instructions for obtaining, for at
3 least one of a plurality of pixels, a cluster factor corresponding to the pixel's
4 intensity and calculating a threshold value as a function of a dot screen and the
5 cluster factor;
6 modulating dot density include instructions for obtaining a dot density
7 factor corresponding to the pixel's intensity and implementing an error diffusion

1 algorithm that is a function of the dot density factor and the threshold value to
2 generate a dot placement factor; and
3 modulating dot size include instructions for obtaining a dot size factor
4 corresponding to the intensity value and generating a halftone print code as a
5 function of the dot size factor and the dot placement indicator.

1 19. The medium of Claim 18, wherein the instructions for:
2 obtaining a cluster factor include instructions for locating a first look-up
3 table entry corresponding to the pixel's intensity and acquiring the cluster factor
4 from that first entry;
5 obtaining a dot density factor include instructions for locating a second
6 look-up table entry corresponding to the pixel's intensity and acquiring the dot
7 density factor from that second entry; and
8 obtaining a dot size factor include instructions for locating a third look-up
9 table entry corresponding to the pixel's intensity and acquiring the dot size
10 factor from that third entry.

1 20. The medium of claim 19, wherein the first, second, and third
2 entries are a single look-up table entry.

1 21. The medium of Claim 18, wherein the instructions for:
2 obtaining a cluster factor include instructions for calculating the cluster
3 factor according to the pixel's intensity;
4 obtaining a dot density factor include instructions for calculating the dot
5 density factor according to the pixel's intensity; and
6 obtaining a dot size factor include instructions for calculating the dot size
7 factor according to the pixel's intensity.

1 22. A computer readable medium having instructions for:
2 for at least one of a plurality of pixels, obtaining a cluster factor
3 corresponding to the pixel's intensity and calculating a threshold value as a
4 function of a dot screen and the cluster factor;

1 obtaining a dot density factor corresponding to the pixel's intensity and
2 implementing an error diffusion algorithm that is a function of the dot density
3 factor and the threshold value to generate a dot placement factor; and
4 obtaining a dot size factor corresponding to the intensity value and
5 generating a halftone print code as a function of the dot size factor and the dot
6 placement indicator.

1 23. A halftoning system, comprising:
2 a placement control operable to modulate a dot density according to pixel
3 intensity and to control a size of a dot cluster according to pixel intensity; and
4 a size control operable to modulate a dot size according to pixel intensity.

1 24. The system of Claim 23, wherein the placement control is operable
2 to modulate a dot density by implementing an error diffusion algorithm that is a
3 function, at least indirectly, of pixel intensity.

1 25. The system of Claim 24, further comprising a look-up table of dot
2 density factors and a look-up table control operable to acquire a dot density
3 factor from the look-up table, the acquired dot density factor corresponding to a
4 given pixel's intensity, and wherein the placement control is operable to
5 implement an error diffusion algorithm that is a function, at least in part, of the
6 dot density factor.

1 26. The system of Claim 23, further comprising a look-up table of
2 cluster factors and a look-up table control operable to acquire a cluster factor
3 from the look-up table, the acquired cluster factor corresponding to a given
4 pixel's intensity, and wherein the placement control is operable to calculate a
5 threshold value as a function, at least in part, of a dot screen and the cluster
6 factor and to implement the error diffusion algorithm that is a function, at least
7 indirectly, of the pixel's intensity and the threshold value.

1 27. The system of Claim 26, further comprising a look-up table of dot
2 density factors and wherein the look-up table control is operable to acquire a dot

1 density factor from the dot density look-up table, the acquired dot density factor
2 corresponding to a given pixel's intensity, and wherein the placement control is
3 operable to implement the error diffusion algorithm that is a function, at least in
4 part, of the dot density factor and the threshold value.

1 28. The system of Claim 24:
2 further comprising a look-up table of dot size factors and a look-up table
3 control operable to acquire a dot size factor from the look-up table, the acquired
4 dot size factor corresponding to a given pixel's intensity;
5 wherein the placement control is operable to implement the error diffusion
6 algorithm to generate a dot placement indicator; and
7 wherein the size control is operable to modulate a dot size by generating
8 a halftone print code as a function of the dot size factor and the dot placement
9 indicator.

1 29. The system of Claim 23, wherein:
2 the placement control is operable to control a size of a dot cluster by
3 calculating a threshold value as a function of a dot screen and a cluster factor
4 corresponding to a given pixel's intensity and to modulate a dot density by
5 implementing an error diffusion algorithm that is a function of the threshold
6 value and a dot density factor corresponding to the pixel's intensity in order to
7 generate a dot placement factor; and
8 the size control is operable to modulate a dot size by generating a
9 halftone print code that is a function of the dot placement indicator and a dot
10 size factor corresponding to the pixel's intensity.

1 30. The system of Claim 29, further comprising:
2 a dot cluster look up table;
3 a dot density look-up table;
4 a dot size look-up table;
5 a look-up table control operable to acquire a cluster factor from the dot
6 cluster look-up table, to acquire a dot density factor from the dot density look-up
7 table, to acquire a dot size factor from the dot size look-up table, the look-up

1 table control operable to acquire each factor from a look-up table entry
2 corresponding to a given pixel's intensity.

1 31. The system of Claim 30 wherein the dot cluster look-up table, the
2 dot density look-up table, and the dot size look-up table are a single look-up
3 table.

1 32. The system of Claim 29, wherein:
2 the placement control is operable to generate the cluster factor and the
3 dot density factor according to the pixel's intensity; and
4 the size control is operable to generate a dot size factor according to the
5 pixel's intensity.

1 33. A halftoning system, comprising:
2 a look-up table control operable to obtain a cluster factor corresponding
3 to the intensity of a given pixel, a dot density factor corresponding to the
4 pixel's intensity, and a dot size factor corresponding to the pixel's intensity;
5 a placement control operable to calculate a threshold value as a function
6 of a dot screen and the cluster factor, and to implement an error diffusion
7 algorithm that is a function of the dot density factor and the threshold value in
8 order to generate a dot placement factor; and
9 a size control operable to generate a halftone print code as a function of
10 the dot size factor and the dot placement indicator.

1 34. The system of Claim 32, wherein the look-up table control, the
2 placement control, and the size control are programs executed by an image
3 forming device having a print engine operable to produce a halftone according to
4 the halftone print code.

1 35. An image forming device, comprising:
2 a print engine operable to receive halftone print code and to produce a
3 printed halftone;

1 a first look-up table having a plurality of entries, each entry corresponding
2 to a pixel intensity and containing a cluster factor corresponding to that pixel
3 intensity;

4 a second look-up table having a plurality of entries, each entry
5 corresponding to a pixel intensity and containing a dot density factor
6 corresponding to that pixel intensity;

7 a third look-up table having a plurality of entries, each entry
8 corresponding to a pixel intensity and containing a dot size factor corresponding
9 to that pixel intensity;

10 a look up table control operable, using a known pixel intensity, to acquire
11 corresponding cluster, dot density, and dot size factors from the first, second,
12 and third look-up tables;

13 a placement control operable to calculate a threshold value as a function
14 of a dot screen and an obtained cluster factor and to implement an error
15 diffusion algorithm that is a function of an obtained dot density factor and the
16 threshold value in order to generate a dot placement factor; and

17 a size control operable to generate and send a halftone print code to the
18 print engine, the halftone print code being generated as a function of an
19 obtained dot size factor and the dot placement indicator.

1 36. A system for generating a halftone from a plurality of pixels,
2 comprising:

3 a means for modulating dot density according to pixel intensity;

4 a means for controlling a size of a dot cluster according to pixel intensity;

5 and

6 a means for modulating dot size according to pixel intensity.